FY99

Project 91-051-00: Monitoring and Evaluation Statistical Support for Life Cycle Studies

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Contract Requirements:

This project contracts for analytical services performed under the direction of Dr. John Skalski of the University of Washington. The contract includes a subcontract with BioAnalysts for the technical services of Dr. Al Giorgi for support in statistical analysis of historical tagging data and statistical support to the region and to assure consistency with the latest context and understanding of the biology and for coordination with the Plan for Analyzing and Testing Hypotheses (PATH).

Project Focus:

This project addresses Council Program measures 5.0F.5 and 3.2F.2 of the present 1994 Northwest Power Planning Council's (NPPC) Fish and Wildlife Program and NMFS 1995-1998 BIOP RPA Sec. 13f. The purpose of this project is to provide statistical support and technical assistance to the monitoring and evaluation efforts of BPA and the Northwest fisheries community in their ongoing efforts to enhance and recover Columbia River salmonid stocks. This project contains tasks that provide support for BPA's own analyses and independent assessment capabilities and peer review which helps us to meet our internal assessment requirements. This project also provides statistical support and assistance to the Northwest fisheries community in the form of helping agency and Tribal scientists with the design and analysis of fish tagging studies.

Project Goals and Objectives:

1. Provide BPA and the Northwest fisheries community with independent state-of-the-art, high-quality statistical assistance and guidance on the design and analysis, and interpretation of fish tagging studies and other research to improve monitoring and evaluation capabilities and to maximum learning and understanding so that the " best available information" is accessible for timely independent assessments and can be used in decision making.

2. Provide consistency in the application of statistical methodologies and analyses across life cycle stages to assure comparability related to performance measures and assessment of results through time, to maximize learning and adaptive management opportunities, and to improve and maintain the ability to responsibly evaluate the success of implemented salmonid mitigation programs and identify future mitigation options.

3. Resolve statistical and data analysis issues so that management institutions can focus on management baselines and biological or resource issues rather than on data analysis uncertainties.

Rationale for Non-Discretionary Status:

As a Federal agency, BPA has certain intrinsic governmental responsibilities that may not be transferred to other entities or voided. Chief among these is preservation of the Federal agency's ability to independently make decisions that commit fiscal and material federal resources. Other responsibilities are statutory or contractual and can only be modified if the governing statute or contract is changed. Implementation of such responsibilities is embodied in certain internal and external contracted activities that BPA has identified as "non-discretionary".

The 1996-2001 Memorandum of Agreement addresses total fish and wildlife expenditures under the Endangered Species Act and the Power Act's Fish and Wildlife Program. BPA recognized that existence of non-discretionary activities required administrative accommodation between non-discretionary and total expenditures. Since 1997 the existence of non-discretionary projects has been brought to the attention of the Council and CBFWA during formal Council sessions and in informal discussions with Council and CBFWA staff prior to completion of the annual prioritization process. Project 91-051-00, *Monitoring and Evaluuation Statistical Support for Life Cycle Studies,"* is considered a "non-discretionary" project.

This contract provides analytical capabilities and analyses needed for fish mitigation and fish impact assessments required of BPA and other federal agencies for compliance with ESA, NEPA, and the NW Power Act. This contract provides critical information and analysis capabilities needed to help focus mitigation efforts to achieve positive fish recovery results with efficient use of limited mitigation funds on both a real-time and planning horizon basis. Much of the work performed by project 91-051-00 provides direct support for In-Season management decisions, ESA Biological Assessments and consultations, and indirect support to the Plan for Analyzing and Testing Hypotheses (PATH). BPA needs and uses the support provided by this project to accountably perform and preserve its ability to independently make decisions related to operations of the hydrosystem and commitment of fiscal and material federal resources for fish and wildlife mitigation programs.

This contract promotes information/technology transfer, institutional learning, and adaptive management by: (1) providing independent monitoring and evaluation statistical support to BPA and the fisheries community; (2) developing and making statistical models, design and analysis tools, software, and Internet-based tools available to all parties to improve monitoring and evaluation capabilities; (3) providing real-time Internet-based value added information products and data integration capabilities for use by NMFS, TMT, and other members of the fisheries community to assist in-season management of fish and river resources, for example, historical timing and real-time predictions on the status of smolt migrations for ESA stocks, NMFS Snake River and Mid-Columbia River ESUs, and other Columbia Basin fish populations; and (4) publishing results on the development and design of analysis tools, the analysis of historical and real-time tagging data and other information for use by the fisheries community, the NPPC and expert scientific forums like the Independent Scientific Advisory Board (ISAB), the Independent Scientific Review Panel (ISRP) and PATH.

The analytical and information support services provided by this contract will continue to be needed in the future to help meet the continuing demands for sound, consistent, statistical analysis of tagging data and the dissemination of results in a timely manner in order to responsibly evaluate and monitor the success of mitigation activities in the Columbia River Basin. The specific analytical support activities required each year will change to meet the needs of BPA and the Northwest fisheries community in their ongoing efforts to enhance and recover Columbia River Basin salmon runs.

FY99 :Project Description Criticisms from Appendix A (page 5) of ISRP Comments on Proposals:

1. While historic data have been impressively analyzed, publications of results in peer reviewed journals are largely missing -- the ISRP encourages peer-reviewed publication of results.

The majority of the publication effort has been devoted to disseminating information on new and improved analytical methods for analyzing salmonid tagging data. In this regard, this project 91-051-00 has more often served as a motivation for new statistical methods and as a source of example presented in those publications. These publications include:

1. Lowther, A. B., and J. R. Skalski. 1998. A multinomial likelihood model for estimating survival probabilities and overwintering for fall chinook salmon using release-recapture methods. *Journal of Agricultural, Biological, and Environmental Statistics* 3: 223-236.

2. Skalski, J. R. 1998. Estimating season-wide survival rates of outmigrating salmon smolt in the Snake River, Washington. *Canadian Journal of Fisheries and Aquatic Sciences* 55: 761-769.

3. Newman, K. 1997. Bayesian averaging of generalized linear models for passive integrated tag recoveries from salmonids in the Snake River. *North American Journal of Fisheries Management* 17: 362-377.

4. Skalski, J. R. 1996. Regression of abundance estimates from mark-recapture surveys against environmental covariates. *Canadian Journal of Fisheries and Aquatic Sciences* 53: 196-204.

5. Skalski, J. R., S. G. Smith, R. N. Iwamoto, J. G. Williams, and A. Hoffmann. 1996. Use of PIT-tags to estimate survival of migrating juvenile salmonids in the Snake and Columbia Rivers. *Canadian Journal of Fisheries and Aquatic Sciences* (in press).

6. Hoffmann, A., and J. R. Skalski. 1995. Inferential properties of an individual-based survival model using release-recapture data: Sample size, validity, and power. *Journal of Applied Statistics* 22: 579-595.

7. Smith, S. G., J. R. Skalski, J. W. Schlechte, A. Hoffmann, and V. Cassen. 1994. SURPH.1 Manual: Statistical survival analysis of fish and wildlife tagging studies. Center for Quantitative Science, University of Washington, Seattle, WA. Prepared for Bonneville Power Administration, Portland, OR.

8. Skalski, J. R., A. Hoffmann, and S. G. Smith. 1992. Testing the significance of individual- and cohort-level covariates in animal survival studies. EURING 92. *In* Marked Individuals in the Study of Bird Populations, pp. 9-28. S. D. Lebreton and P. M. North (Eds.). Birkhauser Verlag. Boston, MA.

9. Cormack, R. M., and J. R. Skalski. 1992. The analysis of coded wire tag returns from commercial catches. *Canadian Journal of Fisheries and Aquatic Sciences* 49: 1816-1825.

In contrast, publications from this project have been fast-tracked as BPA technical reports in response to critical issues in the Northwest fisheries community and for input to forums such as PATH.

2. Does the most efficient relationship exist between this project and project 93-029-00, "Survival Estimates for the Passage of Juvenile Salmonids Through Dams and Reservoirs?"

The NMFS project 93-029-00 is a tightly defined program used to generate current estimates of smolt survival and passage on an annual basis. The UW has a subcontract with NMFS to assist them in fulfilling their contractual needs to analyze the large PIT-tag data sets they have generated. The scope of work varies in response to NMFS needs.

On the other hand, this project 91-051-00 has a much larger mandate to conduct added-value analysis of historical data sets in order to extract information of current interest to the Northwest fisheries community. Here, tagging data are analyzed to better understand migration dynamics and salmonid life cycles. In this role, the UW preserves it ability to provide an independent assessment of the tagging information. Neither NMFS project 93-029-00 nor this project 91-051-00 would benefit from closer affinity, with a potential loss of capabilities, scope, and independent review capabilities.

Another related project is 89-107-00, "*Statistical Support for Salmonid Survival Studies*" which is focused on developing, maintaining, and disseminating new state-of-the-art statistical methods to analyze and design salmonid tagging studies. The Northwest fisheries community releases millions of CWT, tens of thousands of radiotagged, and hundreds of balloon-tagged salmonids annually. No other project has a mandate to assure the best available statistical methods are being used to analyze and interpret these costly studies. Project 89-107-00, therefore, develops statistical methods for all potential users and makes that information available through peer-reviewed publications, statistical software, and technology transfers to such organizations such as NMFS.

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